Prepared in cooperation with the Prairie Island Indian Commu

Water-Quality Data Collected
Island near Welch, Minnesota

Open-File Report 00–78

Water-Quality Data Collected on Prairie Island near Welch, Minnesota, 1998-99

U.S. Department of the Interior
U.S. Geological Survey

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By Thomas A. Winterstein

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Mounds View, Minnesota, 2000

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CONVERSION FACTORS, ABBREVIATIONS, AND UNITS OF CONCENTRATION

Multiply inch-pound unit	By	To obtain metric unit
inch (in.)	2.54	centimenter
foot (ft)	0.3048	meter
gallon (gal)	3.785	liter
degrees Fahrenheit (°F)	5/9 x (°F - 32)	degrees Celsius

Sea level: The North American Vertical Datum of 1988 is the vertical control datum established in 1991 by the minimum-constraint adjustment of the Canadian-Mexican-U.S. leveling observations. It held fixed the height of the primary tidal bench mark, referenced to the new International Great Lakes Datum of 1985 local mean sea level height value, at Father Point/Rimouski, Quebec, Canada. National Geodetic Vertical Datum of 1988 (NGVD of 1988).

Chemical concentrations are given in metric units. Chemical concentrations of substances in water are given in milligrams per liter (mg/L) or micrograms per liter (µg/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as mass (milligrams) of solute per unit volume (liter) of water. Micrograms per liter is a unit expressing the concentration of chemical constituents in solution as mass (micrograms) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter.

Water-Quality Data Collected on Prairie Island near Welch, Minnesota, 1998-99

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ABSTRACT

This report presents the water-quality data collected during 1998-99 from the land owned by the Prairie Island Indian Community at the northern end of Prairie Island, Minnesota. The data were collected by the U.S. Geological Survey in cooperation with the Prairie Island Indian Community. Seventeen monitoring wells were installed by the U.S. Geological Survey in 1998. Fifteen of the wells were installed with the screen at the water-table. The well screens for the other two wells were approximately 26 and 56 feet below the water table. Samples were collected from the wells in 1998. The water-quality properties and constituents determined for the 17 wells include temperature, pH, specific conductance, dissolved oxygen, alkalinity, major ions. nutrients, and iron and manganese. Water samples collected from two of the wells were analyzed for common agricultural pesticides. In addition, semiquantitative immunoassay screens for presence of atrazine and related triazine herbicides were conducted on samples from all 17 wells. Water-surface altitudes were measured during 1999 in the 17 wells and at 8 surface-water sites

INTRODUCTION

The Prairie Island Indian Community is located on Prairie Island between the Vermillion and Mississippi Rivers in Goodhue County, Minnesota (fig. 1). The U.S. Geological Survey (USGS) conducted a study from 1998 through 1999, in cooperation with the Prairie Island Indian Community, to determine the quality of water and the elevation of the water table at the northern end of Prairie Island. The USGS installed 17 monitoring wells during August and September 1998 (fig. 1). Water was collected from wells for analysis during November and December 1998. Water-surface altitudes were measured during 1999 in 17 wells and at 8 surface-water sites (fig. 1).

The purpose of this report is to present the data collected by the USGS during 1998-99. The water-quality properties and constituents determined for the 17 wells include temperature, pH, specific conductance, dissolved oxygen, alkalinity, major ions, nutrients, and iron and manganese. Water samples collected from two of the wells were analyzed for common agricultural pesticides. In addition, semiquantitative immunoassay screens for presence of atrazine and related triazine herbicides were conducted on samples from all 17 wells.

METHODS OF INVESTIGATION AND RESULTS

Seventeen 2-inch diameter monitoring wells were installed during August and September 1998 (table 1, all tables at the back of the report). The wells were surveyed to determine elevation above mean sea level. Well construction details and well logs are in tables 2 and 3, respectively. Fifteen of the wells were installed with the well screen at the water table. The well screens for the other wells, wells 12a and 12b, were approximately 26 and 55 feet below the water table, respectively.

Water samples for water-quality analysis were collected from the 17 monitoring wells during November and December 1998. The samples were collected, preserved, and stored in accordance with procedures described in Koterba and others (1995). The samples were analyzed for chemical constituents at the U.S. Geological Survey National Water-Quality Laboratory (NWQL) in Arvada, Colorado. The samples were analyzed for major ions (fig. 2), nutrients (table 4), and iron and manganese. Samples collected from two of the wells, wells 1 and 14, were analyzed for common agricultural pesticides (table 5).

Field measurements were made in accordance with procedures described in Wilde and Radtke (1998). Field measurements of temperature, pH, specific conductance, and dissolved oxygen were made with a portable, multiparameter meter calibrated at the start of each sampling day. Alkalinity was determined by incremental titration.

Two quality assurance samples were collected. A replicate sample was collected from well 1 (table 4). Replicate samples are collected to assess the quality, reliability, and precision (reproducibility) of the data generated by the analysis of the samples for chemical constituents. The relative percent difference between the values for the sample and the replicate sample are shown in table 6. The relative percent difference was calculated as $[(X_1-X_2)/((X_1+X_2)/2)] *100$, where X_1 is the value for the sample and X_2 is the value for the replicate sample.

A field blank was collected before well 3 was sampled by passing inorganic-free, deionized water through all sample equipment contacted by the actual sample (table 4). Field blanks are collected to ensure that equipment cleaning between sampling sites remove all contamination from the previous site, that sampling and sample-processing procedures do not contaminate the equipment, and that transporting and handling the sampling

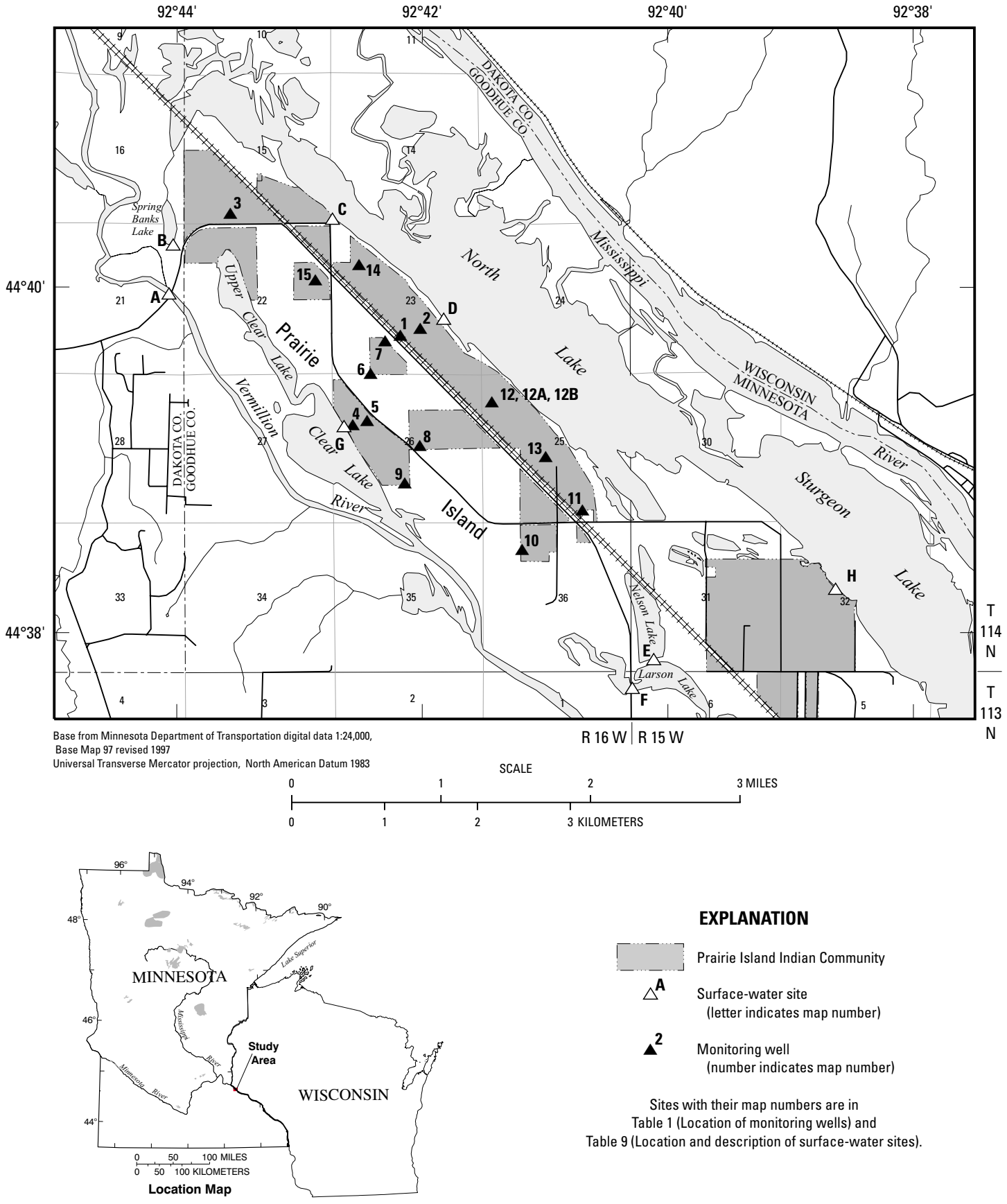

Figure 1. Location map, study area, surface-water sites, and monitoring wells, Prairie Island Indian Community, Minnesota.

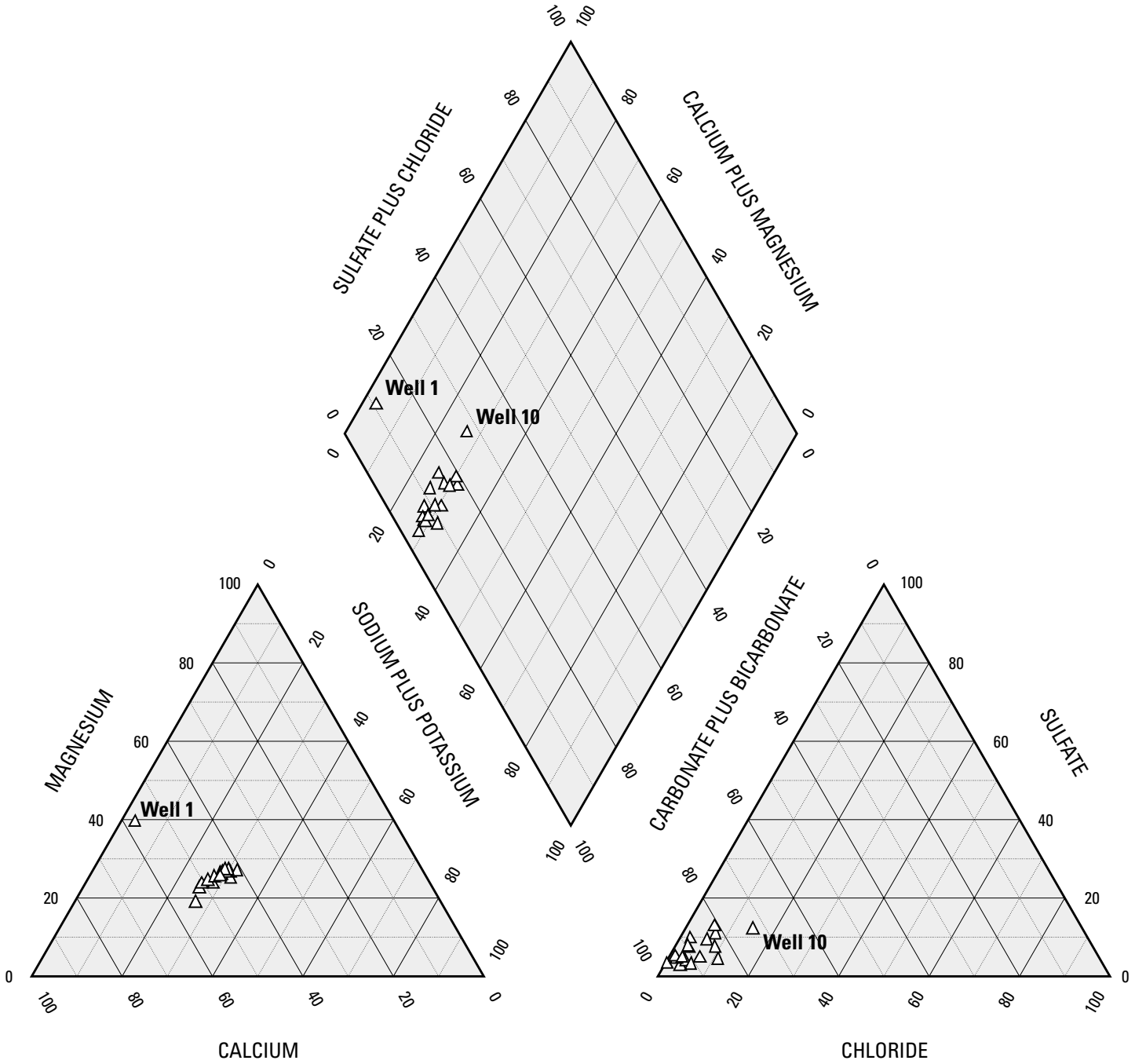

Figure 2. Percentage distribution of major ion concentrations determined for water sampled from 17 wells, Prairie Island Indian Community, Minnesota, November 1998.

equipment between sites does not contaminate the equipment. The concentrations of analyzed constituents in the field blank were below the detection limit or very low compared to the concentrations of the constituents in the samples from the wells. This indicates that the samples were not contaminated by the sampling and equipment cleaning procedures used. The only exception was for dissolved nitrogen ammonia. The concentration in the field blank was just above the detection limit and close to the reported concentrations in the samples from the wells.

The specific conductance measured in the field was significantly different from the specific conductance measured by the NWQL for the samples collected from wells 3, 4, 11, and 15. Review of the field notes and the data indicates that the field values are incorrect and that the specific conductance measured by the NWQL should be used for these samples.

Water from the 17 wells were screened for atrazine and related triazine compounds at the Minnesota District Office of the USGS. An enzyme linked immunoassay test, Atrazine RaPID Assay from Strategic Diagnostics Inc., was used to test the samples for the presence of atrazine and related triazine compounds. The results of the tests are in table 7.

Samples from two of the wells, 1 and 14, were analyzed by the NWQL for atrazine, deethylatrazine, and simazine (table 5). However, the laboratory experienced problems with the analysis and had low recovery of the spiked surrogates used for quality control, indicating that the measured concentrations of atrazine, deethylatrazine, and simazine were too low (Steven Smith, U.S. Geological Survey Water Quality Laboratory, written commun., 1999). In table 5 the concentrations for these compounds are the low, analytical values; they were flagged as estimated concentrations by the NWQL. Mr. Smith calculated corrected concentrations for these compounds based upon the recovery rates of the surrogates. The calculated corrected concentrations are shown in table 8.

Eight reference points for determining surface-water elevations were installed and surveyed to mean sea level (table 9, and fig. 1).

Water levels were measured in the 17 wells and at the 8 surface water sites. Precipitation was measured at 2 of the surface-water sites, Clear Lake and Sturgeon Lake (sites G and H). The results are in table 10 and figure 3.

REFERENCES CITED

Koterba, M.T., Wilde, F.D., and Lapham, W.W., 1995, Ground-water data-collection protocols and procedures for the National Water-Quality Assessment Program—Collection and documentation of water-quality samples and related data: U.S. Geological Survey Open-File Report 95-399, 113 p.

Wilde, F.D., and Radtke, D.B., eds., 1998, Field measurements: U.S. Geological Survey, Handbooks for Water-Resources Investigations, book 9, chapter A6, unpaged.

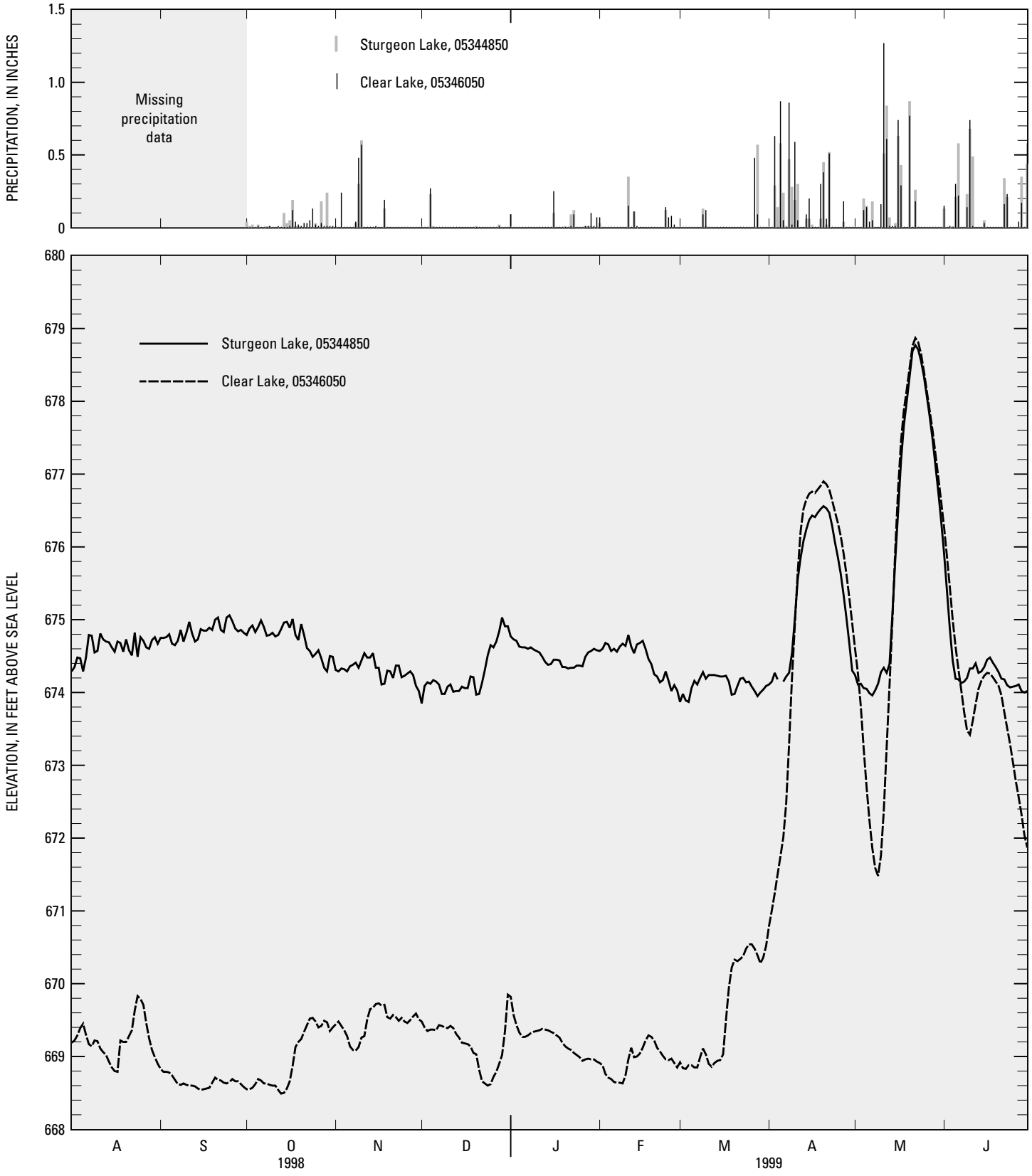

Figure 3. Stage and precipitation at Sturgeon and Clear Lakes, Prairie Island, Minnesota, August 1998-June 1999.

Supplemental Information

Table 1. Location of monitoring wells, Prairie Island Indian Community, Minnesota, 1998-99

[MGS, Minnesota Geological Survey]

Well (shown in figure 1)	Station number	MGS unique well number	Longitude (west longitude)	Latitude (north latitude)	Township, range, section, quarter section (quarter sections are listed from largest to smallest)
1	443944092421101	612783	92° 42′ 11″	44° 39′ 44″	T114NR16W22NW¼NE¼SE¼SE¼
2	443946092420201	612782	92° 42′ 02″	44° 39′ 46″	T114NR16W23NE¼NW¼SW¼NE¼
3	444026092433501	612779	92° 43′ 35″	44° 40′ 26″	T114NR16W15SW¼SE¼SW¼NW¼
4	443912092423501	612787	92° 42′ 35″	44° 39′ 12″	T114NR16W26NW¼SW¼NE¼SE¼
5	443914092422801	612786	92° 42′ 28″	44° 39′ 14″	T114NR16W26NW¼SW¼NE¼NE¼
6	443930092422601	612785	92° 42′ 26″	44° 39′ 30″	T114NR16W23SW¼SE¼SW¼SW¼
7	443941092421801	612784	92° 42′ 18″	44° 39′ 41″	T114NR16W23SW¼SE¼NW¼NE¼
8	443905092420201	612788	92° 42′ 02″	44° 39′ 05″	T114NR16W26NE¼SW¼SW¼SE¼
9	443852092420901	612789	92° 42′ 09″	44° 38′ 52″	T114NR16W26SW¼NE¼SE¼SE¼
10	443829092411201	612793	92° 41′ 12″	44° 38′ 29″	T114NR16W36NW¼NE¼SW¼NW¼
11	443843092404301	612792	92° 40′ 43″	44° 38′ 43″	T114NR16W25SE¼SW¼SE¼NW¼
12	443920092412701	612790	92° 41′ 27″	44° 39′ 20″	T114NR16W25NW¼NW¼SW¼NW¼
12a	443920092412702	612796	92° 41′ 27″	44° 39′ 20″	T114NR16W25NW¼NW¼SW¼NW¼
12b	443920092412703	612797	92° 41′ 27″	44° 39′ 20″	T114NR16W25NW¼NW¼SW¼NW¼
13	443901092410001	612791	92° 41′ 00″	44° 39′ 01″	T114NR16W25SW¼NE¼NE¼NW¼
14	444008092423201	612781	92° 42′ 32″	44° 40′ 08″	T114NR16W23NW¼SW¼NE¼NE¼
15	444003092425301	612780	92° 42′ 53″	44° 40′ 03″	T114NR16W22NE¼SE¼NE¼SW¼

Table 2. Construction information for monitoring wells, Prairie Island Community, Minnesota 1998

Well (shown in figure 1)	Station number	Date installed	Well casing	Well screen	Depth of drilled hole (feet below land surface)	Screened interval (feet below land surface)	Top of well casing above land surface (feet)	Elevation of top of well casing (feet above sea level)	Elevation of top of 6-inch steel protection pipe (feet above sea level)
1	443944092421101	9/3/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	44.5	37.5–41.7	2.85	713.32	713.63
2	443946092420201	9/3/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	33	20.3–24.6	2.84	695.36	695.73
3	444026092433501	8/31/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	13.5	6.6–10.8	2.80	681.31	682.08
4	443912092423501	8/31/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	19	12.1–16.4	3.28	688.68	689.15
5	443914092422801	8/31/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	49.5	43.7–48.0	1.75	717.36	718.23
6	443930092422601	9/1/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	49.5	44.5–48.8	2.99	719.64	719.72
7	443941092421801	8/31/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	7.5	1.9–6.1	2.80	677.46	677.78
8	443905092420201	9/9/1998	2-inch, black steel	5-foot, 10-slot stainless steel	69.5	62.8–67.8	1.96	733.48	734.04
9	443852092420901	8/31/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	19	8.3–12.6	2.06	683.88	684.64
10	443829092411201	9/8/1998	2-inch, black steel	5-foot, 10-slot stainless steel	55	49.6–54.6	3.20	724.56	724.64
11	443843092404301	9/1/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	31	24.7–28.9	2.83	701.06	701.14
12	443920092412701	9/.2/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	24	12.9–17.2	2.89	689.39	689.76
12a	443920092412702	9/2/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	48	39.4–43.6	3.06	689.58	689.95
12b	443920092412703	9/10/1998	2-inch, black steel	5-foot, 10-slot stainless steel	85	68.4–73.4	2.43	689.01	689.64
13	443901092410001	9/2/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	31.5	25.1–29.3	2.80	701.96	702.56
14	444008092423201	9/3/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	22	15.4–19.6	2.93	691.09	691.57
15	444003092425301	9/1/1998	2-inch, flush-threaded, schedule 40 PVC	5-foot, 10-slot PVC	39.5	34.9–39.1	2.71	709.64	710.28

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

Depth (feet below land surface)	Comments
	Well 1
0–0.5	Sandy loam
0.5–4	Poorly-sorted, dark, gray brown, very-coarse sand to pebbles up to 3 by 6 cm. Subangular to subrounded. Clumped when squeezed.
4–8	Moderately poorly sorted, gray brown, subrounded, coarse sand to pebbles up to 1.5 cm. Size gradation is uniform.
8–12	Sand
	Hole material at surface when hole depth was 10 ft. Poorly sorted, dull, gray-brown, subrounded, medium sand to pebbles up to 1 cm. Size gradation is uniform. Does not clump when squeezed.
12–19	Sand and gravel
	Hole material at surface when hole depth was 15 ft. Poorly sorted, dull brown or tan, medium sand to pebbles up to 3 by 5 cm. Most is very coarse sand. About 25 percent, by volume, is pebbles larger than 1 - 2 cm. Subangular to subrounded.
19–21	Sand
21–44.5	Sand and gravel
	Water table 36.9 ft below land surface.
44.5	Bottom of hole. Sample taken from bottom auger section. Moderately, well-sorted dull brown, medium sand to pebbles up to 2.5 cm. Mostly coarse sand.
	Well 2
0– 3	Dark, blackish, silt to fine sand. Clumps when compressed.
3–4	Pebbles and cobbles, 1 - 10 cm.
4–13	Sand and gravel
	Hole material at surface when hole depth was 4 ft. Moderately poorly sorted, light brown, mixed, coarse sand to pebbles up to 2 cm. Mostly clean, very coarse sand less than 1 mm.
	Hole material at surface when hole depth was 9 ft. Grayish brown, coarse sand to pebbles up to 4 cm. Many pebbles. Mostly very coarse sand.
13–19.5	Sand.
	Hole material at surface when hole depth was 14 ft. Grayish brown, very coarse sand to pebbles up to 2 cm. About 80 percent very coarse sand, sub rounded.
	Water table 18.9 ft below land surface.
19.5–23	Sand and gravel
	Hole material at surface when hole depth was 19.5 ft. Grayish brown, very coarse sand to pebbles up to 2 cm. About 80 percent very coarse sand, sub rounded.
23– 27	Sand.
	Hole material at surface when hole depth was 23 ft. Moderately well-sorted, light brown, medium sand to small pebbles up to 6 mm. Mostly medium sand, subangular.
27–27.5	Sand and gravel
27.5–33	Sand.
	Hole material at surface when hole depth was 29.5 ft. Moderately well-sorted, light brown, medium sand to small pebbles up to 6 mm. Mostly medium sand, subangular
33	Bottom of hole. Sample taken from bottom auger section. Poorly sorted, dark brown, fine sand to granules.

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

Well 3	
0– 1	Black, loamy, topsoil.
1–8	Moderately to poorly sorted, brown, coarse to very coarse sand with pebbles up to 3 cm.
	Water table 5.7 ft below land surface.
8–11	Moderately well sorted, light brown, coarse sand to pebbles, well rounded.
11–13.5	Well sorted, medium sand to pebbles up to 1.5 cm.
13.5	Bottom of hole. Sample taken from bottom auger section. Poorly sorted, grayish-brown, medium, coarse sand and granules, pebbles up to 5 mm. Sand subrounded, pebbles well rounded.
Well 4	
0–1	Dark-brown, organic rich, sandy loam. Large pebbles 1 ft down.
1– 6	Very dark-brown, moderately poorly-sorted, medium sand to pebbles up to 3 to 4 cm. Mostly medium sand, some fines. Subrounded.
6–6.5	Large pebbles, 6 cm, in medium to coarse sand.
6.5–7	Well sorted, light brown, coarse sand, some granules up to 4 or 5 mm.
7– 19	Tannish-brown, coarse sand to pebbles up to 5 cm. Mostly coarse sand. Subrounded. Pebbles gradually decreased with depth to very few pebbles.
	Water table 12.3 ft below land surface.
19	Bottom of hole. Sample taken from bottom auger section. Moderately sorted, dark brown, coarse sand to pebbles up to 1 cm. About 80 percent coarse sand.
Well 5	
0– 0.5	Dark brown topsoil
0.5– 13	Very well sorted, dark brown, clean, medium sand.
13 –17	Moderately well sorted, medium brown, medium sand and pebbles up to 1 cm. Mostly medium sand.
17–49.5	Sand
	Hole material at surface when hole depth was 23 ft. Very well sorted, lighter brown, clean, fine to medium sand.
	Hole material at surface when hole depth was 30 ft. Light brown, fine to medium sand with granules and pebbles up to 4 cm.
	Hole material at surface when hole depth was 40 ft. Light brown, fine to medium sand with granules and pebbles up to 2 cm
	Hole material at surface when hole depth was 45 ft. Light brown, fine to medium sand.
	Water table 42.5 ft below land surface.
49.5	Bottom of hole. Sample taken from bottom auger section. Moderately sorted, light brown, medium sand to pebbles up to 4 cm. Sandy diamicton on bit when pulled from hole—poorly sorted, grayed-brown, clay to granule.
Well 6	
0– 1	Topsoil
1–6	Moderately poorly sorted, medium brown, medium sand to pebbles up to 5 cm. Mostly coarse and very coarse sand, subangular to subrounded.
6–17	Moderately well sorted, light brown, medium sand to pebbles up to 1.5 cm. About 70 to 80 percent very coarse sand, angular to subangular. Pebbles subrounded.
17– 18.5	Sand and gravel
18.5–22	Sand
	Hole material at surface when hole depth was 19 ft. Moderately well sorted, medium brown, medium sand to pebbles up to 1 cm. About 80 to 90 percent coarse sand, subangular to subrounded.

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

22– 27	Sand and gravel
	Hole material at surface when hole depth was 24 ft. Moderately well sorted, medium brown, medium sand to pebbles up to 5 cm. About 80 to 90 percent coarse sand, subangular to subrounded. Pebbles occupy about 5 percent by volume.
27–27.5	Gravel
27.5–30	Sand and gravel
	Hole material at surface when hole depth was 29 ft. Moderately well sorted, medium brown, medium sand to pebbles up to 5 cm. About 80 to 90 percent coarse sand, subangular to subrounded. Pebbles occupy about 5 percent by volume.
30– 49.5	Sand
	Hole material at surface when hole depth was 39 ft. Moderately well sorted, medium brown, medium sand to pebbles up to 2.5 cm. About 80 to 90 percent coarse sand, subangular to subrounded. Pebbles occupy about 5 percent by volume.
	Water table 43.5 ft below land surface.
49.5	Bottom of hole. Sample taken from bottom auger section.Well sorted, brown, coarse sand to pebbles up to 1 cm. Mostly coarse and very coarse sand. Subangular to subrounded.
	Well 7
0– 3	Moderately well sorted, Grayish-brown, very clean, subrounded, coarse sand and gravel with pebbles up to 2.5 cm. Large cobbles on surface from grave-pit operation.
3–7.5	Well sorted, grayish brown, subrounded, medium sand to pebbles up to 2.5 cm. From 3 to 7.5 ft material coarsened with depth from medium sand to mostly granules.
	Water table 5.2 ft below land surface.
7.5	Bottom of hole. Sample taken from bottom auger section. Poorly sorted, gray brown, clean, coarse sand to pebbles up to 2.5 cm. Angular to subrounded.
	Well 8
0–3	Well sorted, dark gray, fine sand to coarse sand. About 80 to 90 percent medium sand, clumped when squeezed, held shape.
3–21	Well sorted, medium gray brown, fine to medium sand. About 80 to 90 percent medium sand. Clumped when squeezed but fell apart. Subrounded.
21–23	Dull ochre, clay or silt to fine sand. Clumped when squeezed, fingerprints left impression in squeezed material.
23– 27	Well sorted, light-yellow ochre, fine to coarse sand. Almost entirely medium sand, subrounded.
27– 27.5	Sand and gravel
27– 30.5	Sand
30.5–50	Sand and gravel.
	Hole material at surface when hole depth was 34 ft. Well sorted, light-yellow ochre, fine to coarse sand, almost entirely medium sand, subrounded.
	Many pebbles between 35 - 36 ft.
	Hole material at surface when hole depth was 39.5 ft. Moderately well-mixed, medium grayed brown, very fine sand to pebbles up to 1.5 cm. Mostly medium sand, clumps when squeezed but breaks apart, subrounded.
	Many pebbles between 41 - 43 ft.
	Hole material at surface when hole depth was 44.5 ft. Moderately well-mixed, medium grayed brown, very fine sand to pebbles up to 2 cm. Mostly medium sand, clumps when squeezed but breaks apart, subrounded. About 10 percent pebbles.
	Hole material at surface when hole depth was 49.5 ft. Poorly sorted, dull gray brown, subrounded, medium sand to pebbles up to 2.5 cm, dull gray brown. Mostly medium to coarse sand.
50–69.5	Sand
	Hole material at surface when hole depth was 54 ft. Poorly sorted, dull gray brown, subrounded, medium sand to pebbles up to 2.5 cm., Mostly medium to coarse sand. Material has more small pebbles and granules than at 49.5 ft.

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

	Water table 58.3 ft below land surface.
	Hole material at surface when hole depth was 59.5 ft. Poorly sorted, gray brown, subrounded, medium sand to pebbles up to 5 cm.
	Hole material at surface when hole depth was 65 ft. Poorly sorted, gray brown, subrounded, medium sand to pebbles up to 2 cm, subrounded. Soil is coarser than at 59.5 ft.
	Hole material at surface when hole depth was 69.5 ft. Poorly sorted, gray brown, subrounded, medium sand to pebbles up to 2 by 4.5 cm. Soil is about one-quarter pebbles.
69.5	Bottom of hole. Sample taken from bottom auger section. Poorly sorted, dark gray brown, clean, medium sand to pebbles up to 1 cm. Subangular to subrounded.
	Well 9
0–0.5	Dark, gray-brown, sandy loam.
0.5–4	Moderately well sorted, dark brown, medium sand to pebbles up to 1.5 cm. Mostly coarse sand.
4 –14	Moderately well sorted, medium sand to granules with some pebbles. Color changed gradually from dark brown to light brown with depth. At 4 ft pebbles up to 4 cm. At 10 ft pebbles only 0.5cm.
	Water table 8.6 ft below land surface.
14–18	Well sorted, brown, subrounded, medium sand to granules. Mostly very coarse sand.
18	Layer of large gravel
19	Bottom of hole. Sample taken from bottom auger section.Well sorted, subrounded, very clean granules 1–2 mm with pebbles up to 1 cm.
	Well 10
0–1	Medium to coarse sand.
1–31.5	Moderately well sorted, light gray brown, subangular to subrounded, fine to coarse sand. About 90 percent medium sand. Clumps when squeezed but breaks apart right away.
31.5–42	Sand and gravel.
42–49.5	Sand
31.5–42	Hole material at surface when hole depth was 31.5 through 42 ft. Moderately well-sorted, light gray brown, fine sand to pebbles up to 2.5 by 3.5 cm. Mostly medium to small coarse sand. About 20 percent pebbles.
42–49.5	Sand
	Water table 47.7 ft below land surface.
49.5–54	Sand and gravel
	Hole material at surface when hole depth was 49.5 ft. Moderately well sorted, light gray brown, subrounded, fine sand to pebbles up to 0.5 by 1 cm. Mostly medium sand, some coarse, very coarse sand, and granules present.
55	Bottom of hole. Sample taken from bottom auger section. Very poorly sorted, gray, clean, subrounded, medium sand to pebbles up to 4 cm. About half is pebble sized.
	Well 11
0–6	Well sorted, dark gray brown, subrounded to rounded, very fine to medium sand, clumps when squeezed but breaks apart easily after squeezing.
6.5–20.5	Well sorted, light brown, well sorted, subrounded to rounded, very fine to medium sand; clumps when squeezed but breaks right away. Appears to be mostly quartz.
20.5–23	Sand and gravel
23 –31	Sand
	Water table 23.9 ft below land surface.
31	Bottom of hole. Sample taken from bottom auger section. Very well sorted, brown, clean, subrounded, coarse sand.

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

Well 12	
0 - 1.5	Dark brown, sandy loam.
1.5–8.5	Moderately sorted, reddish brown, coarse sand to pebbles up to 5 cm. Mostly granules about 1 mm.
8.5–14	Moderately sorted, medium reddish brown, subangular, very coarse sand to pebbles up to 2 cm. Mostly granules 1 mm, some 3-4 mm.
	Water table 13.0 ft below land surface.
14–19	Coarse sand and granules. Color has lightened to light brown. Pebbles now 1.5 cm at largest.
	Hole material at surface when hole depth was 19 ft. Almost entirely very coarse sand and small granules.
24	Bottom of hole. Sample taken from bottom auger section. Well sorted, tan, medium sand to granules. Mostly coarse and very coarse sand. Granules up to 2 mm.
Well 12a	
0–1	Topsoil
1–4	Poorly sorted, dark brown, clay or silt to pebbles up to 5 to 10 cm. Many pebbles. Pebbles angular to rounded, rest of soil sub-angular. Compacts into ball when squeezed.
4–18	Moderately sorted, reddish brown, subangular, coarse sand to pebbles up to 2 cm. Mostly very coarse sand.
	Water table 13.2 ft below land surface.
18–26	Well sorted, light brown or tan, very clean, subrounded, medium to coarse sand, some granules.
26	Layer of pebbles.
26–35	Sand
	Material at surface when hole depth was 34.5 ft. Well sorted, light brown or tan, very clean, subrounded, medium to coarse sand, some granules.
35–36	Pebbles and cobbles.
36–40	A layer of fine to very fine sand between 36 - 40 ft. Cleared out pilot bit and reaugered in same hole.
40–47	Sand
47–48	Sand and gravel
48	Bottom of hole. Sample taken from bottom auger section. Moderately poorly sorted, brown, medium sand to pebbles up to 1 cm. About 70 percent is medium and coarse sand.
Well 12b	
0–1.5	Dark brown, sandy loam
1.5–4.5	Poorly sorted, darkish gray brown, subangular to subrounded, medium sand to pebbles up to 4 cm.
4.5–36.5	Sand
	Hole material at surface when hole depth was 4.5 ft. Moderately sorted, gray brown, clean, subangular to subrounded, medium sand to pebbles up to 1 cm. About 80 percent very coarse sand and granule.
	Water table 13.2 ft below land surface.
	Hole material at surface when hole depth was 14.5 ft. Moderately well sorted, medium brown, coarse sand to pebbles up to 1/2 cm. About 80 - 80 percent is very coarse sand.
	Hole material at surface when hole depth was 19.5 ft. Moderately well sorted, medium brown, clean, subrounded, medium sand to pebbles up to 1/2 cm. About 80 to 80 percent in medium sand to coarse sand range.
	Hole material at surface when hole depth was 24.5 ft. Well sorted, medium dull brown, clean, subrounded to rounded, fine sand to pebbles up to 0.75 cm. About 80 to 90 percent is medium sand to small coarse sand.
	A layer of pebbles at 27 ft.

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

	Hole material at surface when hole depth was 29.5 ft. Well sorted, gray-brown, clean, subrounded to rounded, fine or very fine sand to granules up to 4 mm. About 70 percent is fine sand.
	Occasional rocks at 33 ft.
	Hole material at surface when hole depth was 34.5 ft. Well sorted, gray brown, clean, subrounded to rounded, very fine sand to granules up to 2 mm. About 80 percent is fine sand.
36.5–38.5	Gravel and sand
	Hole material at surface when hole depth was 39.5 ft. Well sorted, gray brown, clean, subrounded to rounded, very fine sand to granules up to 2 mm. About 80 percent is fine sand.
38.5–85	Sand
	Hole material at surface when hole depth was 44.5 ft. Well sorted, gray brown, very fine sand to pebbles up to 0.75 cm. Mostly fine sand, clean, subrounded to rounded.
	Hole material at surface when hole depth was 49.5 ft. Well sorted, gray brown, very fine sand to pebbles up to 0.75 cm. Mostly fine sand, clean, subrounded to rounded.
	Hole material at surface when hole depth was 54.5 ft. Moderately sorted, gray brown, clean, subrounded, fine sand to pebbles up to 1/2 cm. Coarser than before. About equal amounts of fine, medium, and coarse sand, which accounts for bulk (about 80 percent) of soil.
	Hole material at surface when hole depth was 59.5 ft. Moderately poorly sorted, gray brown, clean, fine sand to pebbles up to 1.5 cm. Coarser than before. More coarse sand and granules.
	Hole material at surface when hole depth was 64.5 ft. Poorly sorted, gray brown, clean, subrounded, fine sand to pebbles up to 2 cm. Coarser than before, more coarse sand, granules, and pebbles.
	Hole material at surface when hole depth was 69.5 ft. Poorly sorted, gray brown, clean, subrounded, fine sand to pebbles up to 2 cm. Coarser than before, more coarse sand, granules, and pebbles.
	Hole material at surface when hole depth was 74.5 ft. Poorly sorted, gray brown, subrounded, medium sand to pebbles up to 3 cm. About 25 to 30 percent or more pebble sized, rest about equal mixtures of medium, coarse, very coarse sand.
	Hole material at surface when hole depth was 79.5 ft. Poorly sorted, gray brown, clean, subrounded to rounded, fine sand to pebbles up to 4 cm. About 25 to 30 percent pebbles.
	Hole material at surface when hole depth was 84.5 ft. Poorly sorted, gray brown, clean, subrounded to rounded, fine sand to pebbles up to 4 cm. About 25 to 30 percent pebbles.
85	Bottom of hole. Sample taken from bottom auger section. Moderately well sorted, brown, subrounded, medium to very coarse sand. About 95 percent is coarse sand.
	Well 13
0–2.5	Sandy loam
2.5–3	Moderately well sorted, light reddish brown, clay or silt to very fine sand. Clumps when squeezed. Clumps do not break apart.
3–14	Poorly sorted, light reddish brown, fine sand to pebbles up to 2 by 4 cm. Mostly granular, 1 to 2 mm in size. Granules subangular, pebbles rounded.
14–31.5	Sand
	Hole material at surface when hole depth was 14 ft. Poorly sorted, light brown, clean, subangular to subrounded, coarse sand to pebbles up to 1 by 2 cm. Mostly granules.
	Water table 24.9 ft below land surface.
31.5	Bottom of hole. Sample taken from bottom auger section. Moderately well sorted, dull brown, subrounded, coarse sand to pebbles up to 1 cm. About 80 to 90 percent is very coarse sand.

Table 3. Well logs of monitoring wells, Prairie Island Community, Minnesota, 1998

[ft, feet; cm, centimeter; mm, millimeter; well shown in figure 1]

	Well 14
0–0.5	Black topsoil
0.5–8	Poorly sorted, light gray brown, coarse sand to pebbles up to 2 by 5 cm. Pebbles rounded or subrounded. Soil is silty or clayey; when squeezed it clumps then breaks into large pieces.
8–10	Very poorly sorted, gray brown, subangular to subrounded, silt to large pebbles up to 10 cm. About half pebbles, 2 cm and larger, most of the remaining soil is very coarse sand and granules.
10–16	Poorly sorted, dark gray brown, very coarse sand to pebbles up to 5 cm. About 80 percent pebbles 2–5 cm. Rest very coarse sand and granules. Pebbles rounded. Sand and granules subangular and dirty.
	Water table 14.6 ft below land surface.
16–22	Moderately well sorted, gray brown, medium sand to pebbles up to 1.5 cm. Only few pebbles, about equal amounts of granules up to 4 mm and coarse sand. These two comprise about 80 percent of the material.
22	Bottom of hole. Sample taken from bottom auger section. Very poorly sorted, gray brown, angular to subrounded, medium sand to pebbles up to 2.5 cm.
	Well 15
0–2	Poorly sorted, gray brown, fine to medium sand. Clumps when squeezed and holds shape.
2	Layer of gravel
2– 6	Ochre or tannish brown, subangular to subrounded, very fine sand. Clumps when squeezed and holds shape.
6	Layer of pebbles 2 to 6 cm in diameter.
6–12	Very well sorted, dark gray brown, subangular, very damp, coarse to very coarse sand. Occasional pebbles 0.5 to 1 cm.
12–19.5	Sand and gravel.
	Large flat pebbles up to 6 cm in diameter being brought up with the sand when depth was 12–14.5 ft.
	Hole material at surface when hole depth was 14.5 ft. Well sorted, medium red brown, coarse to very coarse sand with an occasional granule.
	Hole material at surface when hole depth was 19 ft. Mixture of medium to coarse sand and pebbles and cobbles. The pebbles and cobbles range from 3–8 cm. The pebbles and cobbles account for about 10 to 30 percent of total material.
19.5–26.5	Sand
	Hole material at surface when hole depth was 24.5 ft. Very poorly sorted, gray brown, medium sand to pebbles. The pebbles range in size from 2 cm to about 5–6 cm. About half the material is pebbles.
26.5–27	Sand and gravel.
27–39.5	Sand
	Hole material at surface when hole depth was 29.5 ft. Moderately sorted, gray brown, medium sand to pebbles up to 6 mm. Majority of material appears to be coarse sand, subangular.
	Water table 34.1 ft below land surface.
	Hole material at surface when hole depth was 34.5 ft. Ochre brown, moderately well sorted, fine sand to pebbles up to 1 cm. Most appears to be fine and medium sand.
	Layer of pebbles at 37 ft.
39.5	Bottom of hole. Sample taken from bottom auger section. Poorly sorted, brownish gray, subangular to subrounded, medium sand to pebbles up to 1.5 cm. About 70 percent is in coarse sand range.

Table 4. Water-quality data collected from monitoring wells, Prairie Island Indian Community, Minnesota, 1998

[mm, millimeter; µS/cm, microSiemens per centimeter; mg, milligrams; µg, micrograms; L, liter; °C, degrees Celsius, <, less than; E, estimated; --, no data; shaded rows are quality assurance samples]

Well (shown in figure 1)	Station number	Date	Water temper-ature (degrees celsius)	Baro-metric pressure (mm of Hg)	Specific conductance, field measurement (µs/cm at 25 °C)	Specific conductance, laboratory measurement, (µS/cm at 25 °C)	Oxygen dis-solved (mg/L)	pH, field measure-ment (standard units)	pH, laboratory measure-ment (standard units)	Total alkalinity, dissolved, incremental titration, field (mg/L as $CaCo_3$)
1	443944092421101	11/23/98	12.3	748	466	486	9.2	7.7	7.9	198
1	443944092421101 Replicate Sample	11/23/98	12.3	748	466	486	9.2	7.7	7.9	198
2	443946092420201	11/20/98	11.4	749	414	420	8.0	7.6	7.8	164
3	444026092433501	11/19/98	11.3	745	677	500	2.2	7.4	7.6	190
3	444026092433501 Field Blank	11/19/98	--	--	--	2	--	--	8.2	--
4	443912092423501	11/19/98	11.9	744	753	554	8.4	7.4	7.6	206
5	443914092422801	11/30/98	10.7	747	545	556	8.7	7.4	7.4	225
6	443930092422601	11/30/98	10.1	747	377	394	10.1	7.7	7.7	196
7	443941092421801	11/20/98	8.3	749	232	248	0.4	8.1	8.1	92
8	443905092420201	11/30/98	11.5	747	422	435	8.7	7.7	7.7	158
9	443852092420901	11/22/98	12	737	590	601	7.4	7.4	7.6	210
10	443829092411201	11/23/98	12.2	748	439	457	9.5	8.0	8.0	110
11	443843092404301	11/22/98	--	737	622	495	--	7.6	7.6	206
12	443920092412701	11/22/98	12.1	737	482	501	9.5	7.4	7.5	202
12a	443920092412702	11/23/98	11.3	748	427	448	5.1	7.8	8.0	174
12b	443920092412703	11/23/98	11.1	748	500	522	0.3	7.8	8.0	245
13	443901092410001	11/22/98	11.2	737	762	782	6.3	7.3	7.4	237
14	444008092423201	11/20/98	12.2	750	583	596	8.6	7.3	7.5	253
15	444003092425301	11/19/98	10.2	743	332	251	9.8	8.1	8.1	87

Table 4. Water-quality data collected from monitoring wells, Prairie Island Indian Community, Minnesota, 1998 (Continued)

Well (shown in figure 1)	Acid neutralizing capacity, unfiltered, titration to Ph 4.5, laboratory, (mg/L as $CaCO_3$)	Carbonate, dissolved, incremental titration, field measure-ment (mg/L as CO_3)	Bicarbonate dissolved, incremental titration, field measure-ment (mg/L as HCO_3)	Solids, residue on evapo-ration at 180 °C, dissolved (mg/L)	Nitrogen, ammonia dissolved (mg/L As N)	Nitrogen, nitrite, dissolved (mg/L As N)	Nitrogen, ammonia plus organic, total (mg/L As N)	Nitrogen, nitrite plus nitrate, dissolved (mg/L As N)	Phos-phorus, total (mg/L As P)	Phos-phorus, dissolved (mg/L As P)	Phos-phorus, ortho-phos-phate, dissolved (mg/L as P)
1	207	0	241	296	<0.020	<0.010	<0.10	6.96	0.025	0.012	0.013
1	207	0	241	300	<0.020	<0.010	<0.10	7.01	0.028	0.013	0.013
2	171	0	200	256	<0.020	<0.010	<0.10	5.42	0.011	0.013	0.014
3	211	0	232	296	0.020	<0.010	0.10	3.13	<0.050	<0.050	0.011
3	1.4	--	--	<10	0.024	<0.010	<0.10	<0.050	<0.050	<0.050	<0.010
4	232	0	251	334	0.026	<0.010	<0.10	12.4	0.010	0.010	0.011
5	235	0	274	340	0.027	<0.010	<0.10	4.27	0.017	<0.050	0.018
6	203	0	240	227	0.028	<0.010	<0.10	0.770	<0.050	<0.050	0.012
7	108	0	112	160	<0.020	<0.010	<0.10	2.24	0.012	0.019	0.017
8	168	0	193	263	0.033	<0.010	<0.10	9.90	0.024	0.012	0.023
9	221	0	257	364	<0.020	<0.010	0.10	14.4	<0.050	0.010	0.010
10	118	0	134	315	0.021	<0.010	<0.10	17.8	0.043	0.022	0.023
11	225	0	251	--	0.030	<0.010	<0.10	5.39	0.051	0.066	0.050
12	226	0	246	--	0.022	<0.010	0.16	7.45	<0.050	0.014	0.013
12a	180	0	212	276	<0.020	<0.010	0.14	3.53	0.033	0.011	0.014
12b	286	0	299	313	0.021	<0.010	0.25	<0.050	0.28	<0.050	0.010
13	264	0	289	464	0.020	<0.010	0.13	27.1	<0.050	<0.050	<0.010
14	287	0	309	356	<0.020	<0.010	<0.10	5.51	<0.050	<0.050	<0.010
15	98	0	106	156	0.023	0.017	<0.10	5.72	0.016	0.019	0.020

Table 4. Water-quality data collected from monitoring wells, Prairie Island Indian Community, Minnesota, 1998 (Continued)

Well (shown in figure 1)	Calcium, dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Potassium, dissolved (mg/L as K)	Chloride, dissolved (mg/L as Cl)	Sulfate, dissolved (mg/L as SO_4)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Iron, dissolved (µg/L as Fe)	Manganese, dissolved (µg/L as Mn)
1	57	24	2.6	1.2	5.2	16	<0.10	22	<10	<3.0
1	57	23	2.5	1.4	5.2	16	<0.10	23	<10	<3.0
2	52	20	4.7	1.7	3.0	18	<0.10	17	<10	<3.0
3	59	21	9.1	0.75	12	25	<0.10	16	<10	<3.0
3	0.13	0.13	E0.59	<0.10	<0.10	<0.10	<0.10	<0.10	<10	<3.0
4	69	25	2.8	0.75	5.5	6.5	<0.10	22	<10	<3.0
5	78	21	4.6	1.5	21	12	<0.10	21	<10	E2.1
6	51	19	2.0	1.0	0.6	6.9	0.10	18	<10	4.7
7	31	11	2.1	1.0	2.0	8.0	<0.10	14	<10	<3.0
8	59	17	2.2	1.2	8.7	8.9	0.14	25	E6.9	16
9	79	24	7.9	0.94	11	23	<0.10	20	<10	<3.0
10	55	17	2.3	1.1	16	18	<0.10	20	18	4.9
11	70	15	11	1.3	6.5	9.2	<0.10	25	<10	E2.5
12	69	23	3.1	0.89	2.8	10	<0.10	21	<10	34
12a	53	20	4.3	0.95	9.4	27	<0.10	18	<10	<3.0
12b	62	25	7.8	1.4	11	8.7	<0.10	18	260	258
13	97	38	5.4	1.3	18	21	<0.10	17	<10	<3.0
14	81	31	2.9	1.0	2.5	14	<0.10	19	<10	<3.0
15	29	10	2.1	0.90	2.0	4.6	<0.10	18	<10	E2.5

Table 5. Pesticide data, Prairie Island Indian Community, Minnesota, 1998

[All values are in micrograms per liter (µg/L); well shown in figure 1; <, less than; E, estimated; values for atrazine, deethylatrazine, and simazine are as reported by the National Water Quality Laboratory. For calculated, corrected values of these compounds see table 8]

Parameter	Well 1	Well 14
Station Number	443944092421101	444008092423201
Date	11/23/98	11/20/98
Acetochlor, filtered, recoverable	< 0.05	< 0.05
Alachlor, dissolved, recoverable	<.05	<.05
Ametryn, dissolved, recoverable	<.05	<.05
Atrazine, dissolved, recoverable	E.085	E.230
Bromacil, dissolved, recoverable	<.05	<.05
Butachlor, dissolved, recoverable	<.05	<.05
Butylate, dissolved, recoverable	<.05	<.05
Carboxin, dissolved, recoverable	<.05	<.05
Cyanazine, dissolved, recoverable	<.2	<.2
Cycloate, dissolved, recoverable	<.05	<.05
Deethylatrazine, dissolved, recoverable	E.137	E.473
Deisopropylatrazine, dissolved, recoverable	<.05	<.05
Diphenamid, dissolved, recoverable	<.05	<.05
Hexazinone, dissolved, recoverable	<.05	<.05
Metolachlor, dissolved	<.05	<.05
Metribuzin (Sencor), dissolved	<.05	<.05
Prometon, dissolved, recoverable	<.05	<.05
Prometryn, dissolved, recoverable	<.05	<.05
Propachlor, dissolved, recoverable	<.05	<.05
Propazine, dissolved, recoverable	<.05	<.05
Simetryn, dissolved, recoverable	<.05	<.05
Simazine, dissolved, recoverable	E.009	<.05
Terbacil, dissolved, recoverable	<.05	<.05
Trifluralin, dissolved, recoverable	<.05	<.05
Vernolate, dissolved, recoverable	<.05	<.05

Table 6. Relative percent difference between concentrations of constituents in the sample and replicate sample from well 1, Prairie Island Indian Community, Minnesota, 1998

[mg/L, milligrams per liter; µg/L, micrograms per liter; <, less than; --, relative percent difference not calculated]

Constituent	Sample	Replicate sample	Relative percent difference (in percent)
Nitrogen, ammonia dissolved (mg/L as N)	< 0.020	< 0.020	--
Nitrogen, nitrite, dissolved (mg/L as N)	< .010	< .010	--
Nitrogen, ammonia plus organic, total (mg/L as N)	<.1	<.1	--
Nitrogen, nitrite plus nitrate, dissolved (mg/L as N)	6.96	7.01	-0.71
Phosphorus, total (mg/L as P)	.025	.028	-11
Phosphorus, dissolved (mg/L as P)	.012	.013	-8.0
Phosphorus, orthophosphate, dissolved (mg/L as P)	.013	.013	0
Calcium, dissolved (mg/L as Ca)	57	57	0
Magnesium, dissolved (mg/L as Mg)	24	23	4.3
Sodium, dissolved (mg/L as Na)	2.6	2.5	3.9
Potassium, dissolved (mg/L as K)	1.2	1.4	-15
Chloride, dissolved (mg/L as Cl)	5.2	5.2	0
Sulfate, dissolved (mg/L as SO_4)	16	16	0
Fluoride, dissolved (mg/L as F)	<.1	<.1	--
Silica, dissolved (mg/L as SiO_2)	22	23	4.4
Iron, dissolved (µg/L as Fe)	< 10	< 10	--
Manganese, dissolved (µg/L as Mn)	< 3.	< 3.	--

Table 7. Results of semiquantitative immunoassay screens for atrazine and related triazine compounds, Prairie Island Indian Community, Minnesota, 1998

[concentrations are approximate in micrograms per liter]

Well (shown in figure 1)	Station Number	Concentration of atrazine and related triazine compounds
1	443944092421101	0.34
2	443946092420201	.11
3	444026092433501	.12
4	443912092423501	.07
5	443914092422801	.06
6	443930092422601	.06
7	443941092421801	.13
8	443905092420201	.07
9	443852092420901	.16
10	443829092411201	.13
11	443843092404301	.07
12	443920092412701	.26
12a	443920092412702	.16
12b	443920092412703	.21
13	443901092410001	.11
14	444008092423201	.71
15	444003092425301	.17

Table 8. Calculated corrected concentrations for selected triazine herbicides, Prairie Island Indian Community, Minnesota, 1998

[All values in micrograms per liter; wells shown in figure 1]

Surrogate recovery				Atrazine compounds		
Surrogate	Concentration added	Concentration recovered	Percent recovered	Compound	Measured concentration	Corrected concentration
Well 1						
d-6-Alpha-HCH	1.0319	0.3902	37.8	Deethylatrazine	0.1373	0.376
d-10-Diazinon	1.0319	.3502	33.9	Simazine	.0090	.025
Terbuthylazine	1.0319	.3889	37.7	Atrazine	.0852	.234
Well 14						
d-6-Alpha-HCH	.9206	.4390	47.7	Deethylatrazine	.4733	1.04
d-10-Diazinon	.9206	.3758	40.8	Atrazine	.2300	.51
Terbuthylazine	.9206	.4341	47.2			

Table 9. Location and description of surface-water sites, Prairie Island Indian Community, Minnesota, 1998

Surface-water site (shown in figure 1)	Surface-water body	Description of reference point	Longitude (west longitude)	Latitude (north latitude)	Elevation of reference point (feet above sea level)
A	Vermillion River	Chiseled square on south bridge railing of County Road 18.	92° 44′ 04″	44° 39′ 58″	694.75
B	Spring Banks Lake	Fence post in Spring Banks Lake	92° 44′ 02″	44° 40′ 15″	672.28
C	North Lake- North	Lag bolt in tree	92° 42′ 44″	44° 40′ 24″	677.08
D	North Lake-Middle	Lag bolt in tree	92° 41′ 52″	44° 39′ 48″	676.69
E	Nelson Lake	Chiseled square on culvert	92° 40′ 07″	44° 37′ 51″	677.87
F	Larson Lake	Chiseled square on east bridge railing of County Road 18	92° 40′ 18″	44° 37′ 41″	695.10
G	Clear Lake	U.S. Geological Survey lake gage, station number 05346050	92° 42′ 36″	44° 39′ 13″	660.23
H	Sturgeon Lake	U.S. Geological Survey lake gage, station number 05344850	92° 38′ 08″	44° 38′ 13″	662.84

Table 10. Measured ground- and surface-water altitudes, Prairie Island Indian Community, Minnesota, 1998-99

[--, no data; wells shown in figure 1]

Date	Water-level altitude, in feet above sea level	Remarks
		Well 1
September 3, 1998	673.43	Miscellaneous measurement
November 12, 1998	673.33	Miscellaneous measurement
February 26, 1999	673.10	Synoptic measurement
May 15, 1999	676.17	Synoptic measurement
July 7, 1999	674.62	Synoptic measurement
		Well 2
September 3, 1998	673.61	Miscellaneous measurement
November 12, 1998	673.46	Miscellaneous measurement
February 26, 1999	673.23	Synoptic measurement
May 15, 1999	676.68	Synoptic measurement
July 7, 1999	674.64	Synoptic measurement
		Well 3
August 31, 1998	672.68	Miscellaneous measurement
November 6, 1998	672.65	Miscellaneous measurement
February 26, 1999	672.49	Synoptic measurement
May 15, 1999	678.31	Synoptic measurement
July 7, 1999	673.80	Synoptic measurement
		Well 4
August 31, 1998	673.06	Miscellaneous measurement
November 6, 1998	672.96	Miscellaneous measurement
February 26, 1999	672.77	Synoptic measurement
May 15, 1999	676.51	Synoptic measurement
July 7, 1999	674.38	Synoptic measurement
		Well 5
August 31, 1998	673.16	Miscellaneous measurement
November 12, 1998	673.00	Miscellaneous measurement
February 26, 1999	672.83	Synoptic measurement
May 15, 1999	676.34	Synoptic measurement
July 7, 1999	674.45	Synoptic measurement
		Well 6
September 1, 1998	673.06	Miscellaneous measurement
November 6, 1998	673.02	Miscellaneous measurement
November 12, 1998	672.98	Miscellaneous measurement
February 26, 1999	672.82	Synoptic measurement
May 15, 1999	676.04	Synoptic measurement
July 7, 1999	674.46	Synoptic measurement
		Well 7
September 10, 1998	673.21	Miscellaneous measurement
November 12, 1998	673.23	Miscellaneous measurement
February 26, 1999	--	Synoptic measurement, well frozen.
May 15, 1999	675.98	Synoptic measurement
July 7, 1999	674.57	Synoptic measurement

Table 10. Measured ground- and surface-water altitudes, Prairie Island Indian Community, Minnesota, 1998-99 (Continued)

[--, no data; wells shown in figure 1]

Date	Water-level altitude, in feet above sea level	Remarks
	Well 8	
September 9, 1998	673.29	Miscellaneous measurement
November 12, 1998	673.22	Miscellaneous measurement
February 26, 1999	673.01	Synoptic measurement
May 15, 1999	676.09	Synoptic measurement
July 7, 1999	674.40	Synoptic measurement
	Well 9	
August 31, 1998	673.33	Miscellaneous measurement
November 6, 1998	673.16	Miscellaneous measurement
February 26, 1999	672.96	Synoptic measurement
May 15, 1999	676.89	Synoptic measurement
July 7, 1999	674.38	Synoptic measurement
	Well 10	
September 8, 1998	673.61	Miscellaneous measurement
November 12, 1998	673.51	Miscellaneous measurement
February 26, 1999	673.26	Synoptic measurement
May 15, 1999	675.83	Synoptic measurement
July 7, 1999	674.30	Synoptic measurement
	Well 11	
September 1, 1998	674.22	Miscellaneous measurement
November 6, 1998	673.80	Miscellaneous measurement
November 12, 1998	673.84	Miscellaneous measurement
February 26, 1999	673.49	Synoptic measurement
May 15, 1999	676.86	Synoptic measurement
July 7, 1999	674.34	Synoptic measurement
	Well 12	
September 2, 1998	673.98	Miscellaneous measurement
November 6, 1998	673.72	Miscellaneous measurement
November 12, 1998	673.72	Miscellaneous measurement
February 26, 1999	673.45	Synoptic measurement
May 15, 1999	676.46	Synoptic measurement
July 7, 1999	674.64	Synoptic measurement

Table 10. Measured ground- and surface-water altitudes, Prairie Island Indian Community, Minnesota, 1998-99 (Continued)

[--, no data; wells shown in figure 1]

Date	Water-level altitude, in feet above sea level	Remarks
	Well 12a	
September 2, 1998	673.31	Miscellaneous measurement
November 6, 1998	673.72	Miscellaneous measurement
November 12, 1998	673.71	Miscellaneous measurement
February 26, 1999	673.45	Synoptic measurement
May 15, 1999	676.53	Synoptic measurement
July 7, 1999	674.64	Synoptic measurement
	Well 12b	
September 10, 1998	673.35	Miscellaneous measurement
November 6, 1998	673.78	Miscellaneous measurement
November 12, 1998	673.73	Miscellaneous measurement
February 26, 1999	673.47	Synoptic measurement
May 15, 1999	676.56	Synoptic measurement
July 7, 1999	674.65	Synoptic measurement
	Well 13	
September 2, 1998	674.17	Miscellaneous measurement
November 6, 1998	673.89	Miscellaneous measurement
November 12, 1998	673.93	Miscellaneous measurement
February 26, 1999	673.60	Synoptic measurement
May 15, 1999	676.78	Synoptic measurement
July 7, 1999	674.49	Synoptic measurement
	Well 14	
September 3, 1998	673.40	Miscellaneous measurement
November 12, 1998	673.30	Miscellaneous measurement
February 26, 1999	673.04	Miscellaneous measurement
May 15, 1999	676.56	Synoptic measurement
July 7, 1999	674.57	Synoptic measurement
	Well 15	
September 1, 1998	672.77	Miscellaneous measurement
November 6, 1998	672.80	Miscellaneous measurement
February 26, 1999	672.55	Synoptic measurement
May 15, 1999	676.14	Synoptic measurement
July 7, 1999	--	Synoptic measurement
	Vermillion River	
	Surface-Water Site A	
February 26, 1999	693.62	Synoptic measurement
May 15, 1999	678.35	Synoptic measurement
July 7, 1999	672.43	Synoptic measurement
	Spring Banks Lake	
	Surface-Water Site B	
February 26, 1999	671.12	Synoptic measurement, Beaver dam downstream
May 15, 1999	678.44	Synoptic measurement

Table 10. Measured ground- and surface-water altitudes, Prairie Island Indian Community, Minnesota, 1998-99 (Continued)

[--, no data; wells shown in figure 1]

Date	Water-level altitude, in feet above sea level	Remarks
July 7, 1999	--	Synoptic measurement
	North Lake - North	
	Surface-Water Site C	
February 26, 1999	--	Synoptic measurement, lake frozen.
May 15, 1999	678.44	Synoptic measurement
July 7, 1999	674.79	Synoptic measurement
	North Lake - Middle	
	Surface-Water Site D	
November 12, 1998	674.47	Miscellaneous measurement
February 26, 1999	--	Synoptic measurement, lake frozen.
May 15, 1999	678.25	Synoptic measurement
July 7, 1999	674.67	Synoptic measurement
	Nelson Lake	
	Surface-Water Site E	
February 26, 1999	--	Synoptic measurement, lake frozen
May 15, 1999	677.22	Synoptic measurement
July 7, 1999	672.12	Synoptic measurement
	Larson Lake	
	Surface-Water Site F	
February 26, 1999	668.77	Synoptic measurement
May 15, 1999	677.24	Synoptic measurement
July 7, 1999	671.48	Synoptic measurement
	Clear Lake,	
	U.S. Geological Survey lake-gage 05346050	
	Surface-Water Site G	
February 26, 1999	668.97	Synoptic measurement, mean daily stage
May 15, 1999	675.98	Synoptic measurement, mean daily stage
July 7, 1999	672.01	Synoptic measurement, mean daily stage
	Sturgeon Lake	
	U.S. Geological Survey lake-gage 05344850	
	Surface-Water Site H	
February 26, 1999	674.02	Synoptic measurement, mean daily stage
May 15, 1999	675.84	Synoptic measurement, mean daily stage
July 7, 1999	674.30	Synoptic measurement, mean daily stage